SOIL conservation

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From the Administrator

Still Young at Forty

At age 40, the Soil Conservation Service is still a vigorous young agency. One of the reasons is our readiness to try out new ideas. Every one of our authorities began with an idea. Our programs continue to be enriched by innovations to meet public interest and natural resource needs.

Useful new techniques and ideas have come from many sources—our own employees, conservation district officials, land and water contractors, manufacturers—and, importantly, landowners themselves.

Some innovations have been relatively simple, once they've been worked out. For instance, the use of rice hulls as "containers" for tiny grass seed in a grain drill was a major breakthrough in a range improvement program started in the early 1950's in California. It meant any grain drill could be converted to a precision grass drill.

SCSers had experimented with cracked grain, sawdust, even sand, before working with the cup-shaped rice hulls. Their work has resulted in reseeding thousands of acres in the West to legumes and improved grasses.

A more recent, more sophisticated innovation is that of SNOTEL—snow telemetry. We're beginning to use nature's satellites—meteor shower paths—for "bouncing" radio signals to data centers from automatic sensing devices at snow survey reporting stations in the West. The payoff will be more accurate, more timely water supply forecasts.

New ideas may be irritating and threatening at times. Yet we have a responsibility to be receptive and to refrain from an instinctive, instant "No." We have an equal responsibility to avoid the instant "Yes" to new ideas—we need to think them through.

Our budget and personnel situation makes it more important than ever that we be alert to—and seek out—ways to improve both efficiency and effectiveness in managing personnel, fiscal, and equipment resources. We cannot afford to let these resources be underused or improperly used. We encourage landowners to use their natural resources wisely; we can do no less than use our own resources just as prudently.

Our mission offers each of us many opportunities to encourage new thinking in the Service. Innovative work has always been a source of pride in SCS. It's what helps us get the job done—the best way we know how.

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Earl L. Butz
Secretary of Agriculture

R. M. Davis, Administrator
Soil Conservation Service

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Diana Morse
Editor

Maryellen Bertram
Editorial Assistant

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COVER: On the Dillingham Ranch south of Tulsa, Oklahoma, SCS District Conservationist John Worthy (left) and Soil Conservationist Dale Ratliff, Jr., (right), look at recovered native rangeland with Tom Dillingham (see story on page 13).

'Improved Service' Sparks Berks County Agricultural Service Center

by Frederick E. Bubb
Information officer, SCS, Harrisburg, Pennsylvania

Have you ever called a government office, found out you had the wrong agency, and then called three or four numbers before you got the right office? Or have you had to drive from town to town to visit U.S. Department of Agriculture offices? This used to be the case in Berks County, Pennsylvania.

Recognizing the need for improved service to the agricultural community, Berks County officials looked for an opportunity to improve government assistance. About this time USDA began a program of encouraging housing all its agencies in a single building, called an agricultural service center. This concept appealed to the Berks County commissioners and a decision was made to build the first agricultural service center in Pennsylvania.

At the Berks County facility, the conservation district clerk staffs the information center, answering questions of local farmers and other visitors.

Agricultural agencies now operate with facilities never dreamed possible. Several sizes of conference and meeting rooms are available, including an auditorium which seats several hundred people. Equipment rooms, ample storage space, abundant parking, and even a lunchroom are extra facilities in the building.

Showing great foresight, the Berks County commissioners added several other uses to the building. Civil defense and county communications are in the basement. The lunchroom is also in the basement and provides a dual role as food support for the civil defense operation. The building contains all county storage and shop facilities. Craig Williamson, of the Pennsylvania Civil Defense Council, termed the building outstanding, attractive,

The agricultural service center in Berks County is one of five in Pennsylvania.

and at the same time, functional.

The Berks County center houses the Cooperative Extension Service, Agricultural Stabilization and Conservation Service, Farmers Home Administration, and Soil Conservation Service, USDA. Other agencies in the center include the county conservation district, which operates the reception and information center, and an Intermediate Education Unit and County Weights and Measures Office.

County Commissioner Vernon K. Shaffer, who also serves on the conservation district board, states, "I am pleased and proud to have been part of the team that helped make this agricultural center a reality. In this day of hunger in the world, the farmers of Berks County need all the help they can get."

The public reaction to the center has been good. Before the center, USDA agencies were located in three towns. SCS District Conservationist J. Norris Judy reports that more farmers are coming to the agency offices now. Berks County farmer Mark Wolfskill echoed this feeling. According to Wolfskill, "Farmers can now visit all the agencies under one roof, saving them time and gasoline along with the convenient and free parking. I think farmers will now participate in more programs because of the accessibility of visiting all these agencies under one roof."

The Berks County center is one of five agricultural service centers in Pennsylvania. Others are in operation in Erie, Lancaster, Dauphin, and Washington Counties. All are enthusiastically supported by farmers and agency personnel.

Erie County dairy farmer Calvin Henry commented, "Service centers are a definite advantage to farmers who use the services of a number of agencies. The common phone number and joint meeting room are a big help to farmers."

Another Erie County farmer, Burdette Sedler, added: "It is much easier to get your questions answered promptly." He noted that the modern facilities also benefit the agency personnel.

O. Bard Judy, SCS district conservationist in Washington, Pennsylvania, spoke for all the SCS district conservationists in Pennsylvania who operate in service centers: "We are finding that cooperation between the agencies increases greatly—we are working together more now than ever before." ◆

1975 Education Awards In Environmental Conservation

by Jan Curtis
Information Division, SCS, Washington, D.C.

The National Association of Conservation Districts (NACD) and the Allis Chalmers Corporation have picked the top winners of their Education Awards Program in Environmental Conservation.

One is a North Carolina teacher whose efforts have immersed the community in environmental education.

The other is a Michigan conservation district which has helped 65 schools develop school site conservation plans.

The awards program is designed to create an awareness of the value of environmental conservation education and stimulate efforts by conservation district officials and teachers to advance the wise use of the nation's natural resources.

Mrs. Irene McIver, a third grade teacher in Greensboro, North Carolina, is the 1975 Environmental Conservation Education Teacher of the Year and the Kalamazoo Soil Conservation District, Michigan, has won the district award.

Each will receive a check for $1,500 at the NACD convention in Honolulu, Hawaii, in February.

Mrs. McIver, who was runner-up last year, has developed an action-oriented, "hands-on" approach to environmental education at General Greene Elementary School. She and her third graders developed the school site as an outdoor learning laboratory used by all grades at the school.

She is chairman of the faculty committee to develop a program to include environ-

The Kalamazoo Conservation District in Michigan won the top district award in the 1975 NACD-Allis Chalmers education awards program. Pat Chilton, environmental education coordinator for the district, and Lawrence McGowan, district chairman, work with children in an outdoor classroom.

mental education in all areas of study at the school. She has also assisted the faculty at Caldwell, a companion school for grades 4-6, in developing a followthrough program to the environmental studies begun at Greene, which has kindergarten through third grade.

Through her encouragement and leadership, many parents and more than 40 resource people and community groups have helped with the outdoor classroom and environmental studies at Greene.

Greene students have built birdhouses and feeders to be used in backyards, worked on eroding areas at home, cooperated in Greensboro's project of recycling cans, paper, and glass, and participated in Keep North Carolina Beautiful and City Beautiful programs.

In a project called Operation Wildflower, students transplanted hundreds of wildflowers from an area being bulldozed to the school's outdoor classroom.

Mrs. McIver was nominated by the Guilford County Soil and Water Conservation District.

The second top winner, the Kalamazoo Soil Conservation District, now has 65 schools in the district with conservation plans for the entire school site. Fourteen were added during the 1974-75 school year.

The district's efforts last year centered on inner-city schools. Officials sought to help students and teachers use and develop limited land resources and facilities as outdoor classrooms.

With the help of its full-time education coordinator, Pat Chilton, the district held more than 10 in-service workshops during the year to help teachers in outdoor classroom work.

Through a series of community meetings arranged by the district, parents and the community were informed about outdoor classrooms and what they could do to help.

A miniature school site exhibit and a similar home site display, constructed with the help of personnel from the Kellogg Bird Sanctuary, are often used at meetings and school open houses to help explain outdoor classrooms and wise land use.

The district presents an award each year to the school that has done outstanding work in environmental education. It also sponsors a Conservorama, a day-long tour of the Kellogg Bird Sanctuary, Farm, and Forest, for 2,200 fifth graders. The Conservorama runs for a week and involves the district's junior board and more than 100 volunteers.

Regional winners in the second annual Education Awards Program in Environmental Education in the teacher category were:

Upper Mississippi Region—Lyle Bradley, high school science teacher, Anoka, Minnesota, nominated by the Anoka County Soil and Water Conser-

Named 1975 Environmental Conservation Education Teacher of the Year, Mrs. Irene McIver teaches in Greensboro, North Carolina.

vation District, runner-up for the national award. Bradley was honored for his program of environmental education at Anoka Senior High School and for his help to 34 schools in environmental education programs and effective use of school sites as outdoor classrooms.

Northeastern Region—Thomas J. Plati, high school chemistry teacher in Dover-Sherborn High School, Dover, Massachusetts, nominated by the Middlesex Conservation District. Plati's interdisciplinary program in environmental research involves his students in studies of local issues, including water quality, air pollution, energy use, and solid waste problems.

South Central Region—Mrs. Carolyn Fiser, sixth grade teacher in J. W. Baker Elementary School, Little Rock, Arkansas, nominated by the Pulaski Conservation District. Mrs. Fiser has been a leader in developing and using a large wooded area adjacent to the school as an outdoor classroom. In addition, she and her sixth grade students developed a miniature outdoor classroom in an open courtyard on the school site, hauling soil, planting trees and shrubs, putting up bird feeders, and installing weather-monitoring equipment.

Northern Plains Region—Robert Legoski, director of the Conservation Center for Creative Learning, Lander, Wyoming, nominated by the Popo Agie Conservation District. Legoski teaches and arranges special conservation and environmental activities and trips for students and in-service workshops for teachers in the Lander School District.

Southwestern Region—Joan M. Charlson, teacher-in-residence at the Jefferson County Outdoor Education Laboratory in Denver, Colorado, nominated by the Jefferson County Conservation District. All 6,400 sixth graders and their teachers in the county—from 78 schools—participate in a week-long resident program at the laboratory.

Pacific Region—Gerald W. Stoops, junior high school teacher, San Bernardino, California, nominated by the Redlands - Highland - Yucaipa Resource Conservation District. Stoops was selected for his work in involving young people in beautification and community service projects and activities.

Regional winners in the district category included:

South Central Region—Logan County Conservation District, Oklahoma, runner-up for the national award. With the help of its youth board, the conservation district sponsors a week-long environmental camping program for all sixth graders in the school district. Two camps are held each year, one for sixth graders in the Guthrie area and one for sixth graders in the remainder of the county.

Northeast Region — New Castle Conservation District, Delaware, has worked with the State Department of Public Instruction and the 12 school districts in the conservation district in developing outdoor classrooms and organizing teacher orientation and training workshops. The conservation district also sponsored a 10-week summer demonstration project during which 90 students helped develop trails, improve wildlife habitat, and stabilize critical areas in an 85-acre county park.

Southeastern Region—Aiken Conservation District, South Carolina, for its work in helping develop outdoor classrooms; sponsoring students and teachers to state and local workshops; conducting an environmental tour for school officials, mining representatives, ministers, and county officials; and for a community education effort which resulted in unanimous approval of a county sediment control ordinance.

Northern Plains Region — Central Platte Natural Resources District, Nebraska, which sponsored an off-campus 3-credit hour conservation course for teachers. It also initiated an 18-segment conservation education television series available to all schools in the state.

Southwestern Region — A joint entry by the Blacksmith Fork Soil Conservation District and the North Cache Soil Conservation District, both in Cache County, Utah. The districts were instrumental in helping develop an outdoor classroom that will be used by all students in the county. They also successfully encouraged the school district to develop curriculum manuals for kindergarten through the twelfth grades.

Pacific Region—San Jacinto Basin Resource Conservation District, California, which stated: "The most significant contribution made by our district during the 1974-75 school year was the formation of our San Jacinto Basin Resource Conservation District Junior Board." The 23 junior board members developed their own annual plan of activities, which included helping develop outdoor classrooms, planting trees and seeding wildflowers on eroding areas, and securing native plant materials for the environmental education center at their high school. ♦

Terraces Protect Glen Ullin

by Herbert Mittelstedt
District conservationist, SCS, Mandan, North Dakota

What happens when you combine rain, steep slopes, and a light vegetative cover? You get damaging runoff, right?

The City of Glen Ullin, North Dakota, with a population of 1,070, had a runoff problem. It lies at the lower end of a 300-acre drainage area with steep slopes, slowly permeable soils, and poor vegetative cover. After rains the runoff often caused flooding and subsequent sediment damage. Development in the city increased the problem. Water coming into the city through a 60-inch culvert was choked down by 24-inch pipes and blocked drainage ways, and the end result, of course, was flooding.

In March of 1970, city officials asked for help from the Soil Conservation Service to reduce flooding and sediment damage.

The Soil Conservation Service suggested two possible solutions.

One solution involved diverting runoff away from the city. It involved building two bridges. This was not accepted because of the high cost.

The solution agreed to included terraces, diversions, sediment impoundment, and establishment of grass. These works of improvement now hold much of the rain on the land and divert the excess away from the city.

A completed erosion control system, including terraces and diversions, protects Glen Ullin, North Dakota, from sediment and flood damage.

This improvement received a big boost when the landowners in the drainage area agreed to donate necessary easements. One of the landowners, seeing the benefits to his own farm, said, "I can see a day when terraces and diversions will have to be installed if we plan to continue profitable farming." His comment related to the excessive runoff and erosion occurring on cropland in the area with the same soil and slope problem.

The next hurdle was financing. The Soil Conservation Service, through the Resource Conservation and Development Project, agreed to cost share 80 percent of the construction. City officials asked the Morton County Water Management District for help and the district agreed to assume the balance, the local costs.

Diverting water down a state highway road ditch was part of the plan. At a public meeting, a review of the plan with the North Dakota highway commissioner yielded the needed easement.

Bids were let for construction in June of 1973, and construction started in July. When the project was completed in 1974, the result was more than 12,000 feet of level terraces with drains, 10,000 feet of diversions, a sediment pond, a water control structure, and 42 acres seeded to grass. The grass seeding converted the remaining cropland in the drainage area to grassland.

The system got its first big test in the spring of 1975, when more than 15 inches of rain and snow fell on Glen Ullin.

"This is a North Dakota first, using regular conservation practices to protect a town, and quite successfully," said Richard Moum, SCS state engineer. ♦

'Soils and Society'—'Earthy' New Exhibit At Science Museum of Minnesota

by Thomas C. Gahm
Information specialist, SCS, St. Paul, Minnesota

Most conservationists know that soil has important influences on our society and on the way we live. They know, too, that soil is bigger than we are.

The Science Museum of Minnesota and the Soil Conservation Service are proving that point to the half a million students and adults who visit the St. Paul-based museum each year. Making the point is "Soil and Society," a permanent soil and water conservation exhibit which opened last summer.

Walking into the exhibit is like tunneling into a big chunk of soil. When you get inside you begin finding out what makes soil tick and why use of soil has so many implications for our society.

"I don't think people realize that use of soil is really basic to our culture and at the root of many of our problems today," says Diana Hays, director of the museum's physical and environmental sciences section. "In this exhibit we've magnified soil to be bigger than life because in actuality, it is bigger than life."

From the outside, the $29,000 exhibit looks as if it had been lifted out of the ground. Several soil horizons are visible, with bedrock as the bottom layer and vegetation at the top. Inside, roots dangle from the ceiling. The floor is a soft carpet, to give the feeling of walking on soft ground.

"We even did some research into simulating the smell of freshly tilled soil," says Ms. Hays, "but decided not to adapt the technology to this exhibit."

Ms. Hays coordinated development of the exhibit. She translated the technical information and ideas provided by SCS personnel into words, pictures, and mechanical devices to attract and inform museum visitors.

"SCS provided more ideas for this project than usual for an outside source," she said. "We depended on SCS because they have so many technical people. A science museum is at its best when working with technical people."

The exhibit puts special emphasis on participation by the visitor and offers many "hands on" opportunities. By far, the most popular is a push-button land use quiz. A visitor can choose one of seven land uses and then select the soil properties most appropriate for that use.

Visitors can also use a soil auger, which extracts a soil profile from "the ground," and settling tubes, which demonstrate how different-sized soil particles stay suspended in solution for varied lengths of time.

"People learn by doing," says Ms. Hays. "They tend to remember with action better than they do just by reading labels."

An entire wall of soil profiles is also popular. The eight profiles, selected for their differences in color, texture, and other physical properties, were gathered throughout Minnesota by SCS soil scientists. The profiles are 5 feet high and mounted in glass cases. Below each profile is a description of the soil—its name, properties, location and use. Above each is a color transparency of the landscape on which the soil occurs. Other features of the exhibit include:

—a comparison of the differences in sizes among soil particles.

—a display showing how the soil survey can be used to estimate differences in crop yields.

—a sculpture showing how different soils occur in a landscape.

—four high-impact color photographs showing people interacting with soil.

At the entrance of the exhibit that is "like tunneling into a big chunk of soil" at the Science Museum of Minnesota are Diana Hays, who coordinated the exhibit, Philip Taylor, director of the museum, and Harry Major, SCS state conservationist in Minnesota. SCS provided technical information and ideas for the new exhibit.

Captions explain the link between soil and a particular land use.

—a display illustrating how soil erosion and sedimentation contribute to water pollution.

—the SCS series of pamphlets "Soil Surveys Can Help You."

"In planning the exhibit we assumed that the person coming in would have no knowledge of soils at all," Ms. Hays said. "He might have an interest in science or agriculture from a food consumer's point of view but probably hadn't given a second thought to the problems of soil.

"One of the first questions we asked ourselves was 'how do you get across the fact that soil has a personality, a behavior that is predictable?' We wanted people to see that if they don't care about soil they could be in trouble."

Since the exhibit opened in July, the museum has distributed more than 6,000 SCS publications. More than 12,000 people have been through the exhibit.

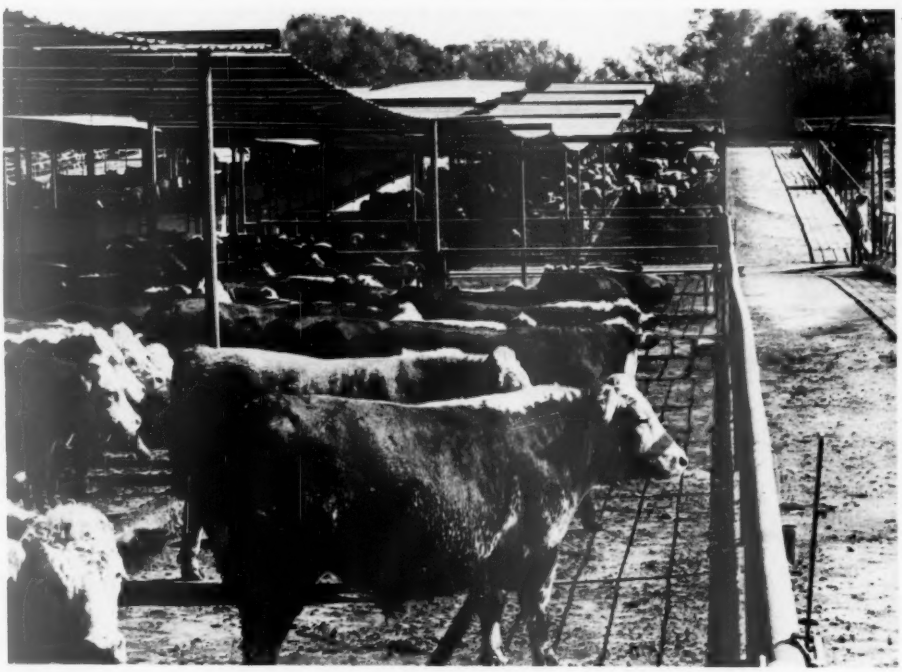
A series of special workshops is available to school groups and the general public. Ten-minute demonstrations—based on the SCS publication "Teaching Soil and Water Conservation, A Classroom and Field Guide"—are presented by theater students recruited by the museum. The topics of the demonstrations are: "How Does Crop Cover Affect Soil Loss?," "How Does Mulch Prevent Soil Loss?," "What Does Contouring Do?," and "Make Splash Boards to Study Splash Erosion."

In addition, the museum's Saturday Morning Clubhouse will offer presentations on conservation and careers in soil conservation to groups of up to 250 students.

"Soils and Society" is a step in a new direction for both SCS and the science museum.

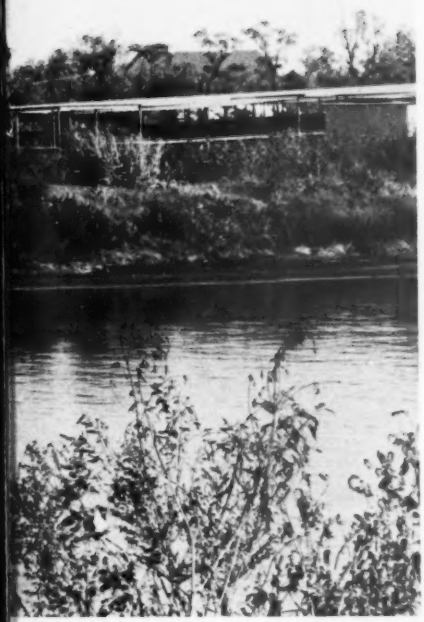
For the museum, it is the first time it has used funds from an outside organization to match a special environmental grant received several years ago. The grant stipulates that the museum will use outside community resources to establish a new environment section called "Man's World Today."

SCS has been the major community resource in this particular exhibit, and as a result, people who visit the Science Museum of Minnesota are learning that soil and its conservation is one of the things that makes "Man's World Today" go around. ♦



Recycling Resources Pays Off on Oklahoma Ranch

by Anne Zack
Information Division, SCS, Washington, DC



Driving north from Okmulgee along Oklahoma Highway 75, six bright blue silos stand against the eastern horizon. These silos mark the 11,000 acre Dillingham Ranch—one of the first ranches in the state to retrieve feed from its feedlot.

Brothers Tom and Dan Dillingham added the feedlot to their cow-calf operation 2 years ago. The feedlot was designed to use the excess forage produced on their ranch and, also, to avoid polluting a watershed that affects 20,000 people.

When the Dillingham family bought the ranch in 1956, just at the break of a drought, more than 1,200 acres were wornout cropland and the rest was mostly heavily overgrazed range. "The grass was grazed down so short," recalled Tom Dillingham, "that it was slick as the tile floor we're standing on."

Cooperators with the Okmulgee County Conservation District, the Dillinghams requested technical assistance from the SCS district conservationist and area range conservationist in establishing the cropland to bermudagrass, crossfencing the range, and building more than 30 stockwater ponds.

In 1969, the Dillinghams had their conservation plan revised to include a deferred rotation grazing system. Their cattle, mainly Herefords, Angus, and Brahmans, are now managed in herds of 240 to 285 cow units. Each herd is assigned two pastures and is rotated between them for three grazing periods during the year.

Under this grazing system, the range produced more indi-

Liquid waste from the feedlot is aerated in a lagoon (top photo) and used as washwater or fertilizer. The feedlot is flushed daily, with water released at the upper end of the sloping pens and emptying into a trench for eventual recycling.

SCS District Conservationist John Worthy and Tom Dillingham look at the native grasses . . .

angrass, big and little bluestem, and switchgrass than the cattle could graze. The Dillinghams wanted to use the excess grass, but they rejected the more common types of feedlots as too inefficient.

Tom and Dan Dillingham traveled from South Carolina to California to check feedlots in operation, read up on university research, and sought technical assistance from SCS so they could design the most efficient feedlot for their purpose.

Completed in 1973, the feedlot has 16 pens and a capacity of 1,600 head of cattle. John Worthy, SCS district conservationist in Okmulgee County, provided soils information and consultive assistance in constructing the feedlot so that the concrete floors slope down to an open concrete trench. Water is released daily at the upper end of the pens to flush the waste into the trench.

The brothers recycle the solid waste for feed by first separating it from the liquid waste, mixing it with ground hay, and storing it in a silo for 30 to 45 days.

The liquid waste is aerated in a lagoon and then is either reused as washwater on the pens or as fertilizer on nearby bermudagrass pastures or cropland. Worthy provided assistance in the design of three lagoons on the ranch—one for day-to-day use, another to take care of excess waste, and a third to catch any spillover. SCS technicians also laid out diversions to keep the liquid waste used as fertilizer from polluting Okmulgee Creek.

Because the creek starts on the ranch, about 5 miles upstream from the town of Okmulgee, management of the ranch has a direct impact on the watershed. Besides designing the waste recycling system to avoid pollution, the Dillinghams have helped control flooding along the creek and in the town by practicing improved range management and by taking part in the Okmulgee Creek Watershed Project.

When the Dillingham family began working with SCS to improve their native range, the only vegetation was sparse patches of low-quality grasses. Rainfall ran off the land with every storm, swelling the creek into a torrent that rushed through the middle of Okmulgee. People caught on one side of the creek could not get across to their jobs, schools, or the hospital on the other side of town.

Now that the native range on the ranch has recovered, the thick grass holds most of the rain, letting it soak into the soil instead of running off into the creek.

Tom and Dan Dillingham took one more step to keep the floods from damaging Okmulgee. They provided all the ease-

. . . which, under proper range management, now provide bountiful grazing for beef cattle.

ments for the key flood control structure of the watershed project which is located on their ranch.

Since the dam, which can hold back runoff from a 100-year storm, was completed in 1966, Okmulgee Creek has flooded only once. A storm early in June of 1974, prior to completion of planned channel improvement, flooded about 50 blocks of Okmulgee for 2 to 3 hours. Local watershed project sponsors estimate this storm was equal to the one in 1948, when flooding left 2,000 people homeless in a 150-block area for 3 to 4 days.

"Without the land treatment the Dillinghams are practicing and without the dam on their property," concluded Worthy "we simply couldn't have a successful watershed project." ♦

Bulls on the ranch are kept on pastures of Coastal bermudagrass.

Review

The Mechanics of Frozen Ground. N. A. Tsytovich. 1975. Translated from the Russian original by Scripta Technica, Inc. George K. Swinzow, ed., and Gregory P. Tschebotarioff, adv. ed. *McGraw-Hill Book Co., New York. 426 pp, illus. $34.50.* Permafrost underlies about 20 percent of the earth's land surface, both in tundra areas and in the forested subarctic. Research into the properties of frozen ground has been underway in North America since World War II, but only after the development of oil and gas resources in the Arctic and the furor over construction of the Alaska oil pipeline has it attracted general interest among engineers. In the U.S.S.R., where permafrost occurs in about one-half of the country, the problem was much more immediate and extensive research was inaugurated many years ago. N. A. Tsytovich, the author of *The Mechanics of Frozen Ground*, has been involved in this research since 1928 and is a leading authority on the mechanics of frozen soils. His book, published originally in 1973, is an up-to-date exposition of the results of Russian and other (including American) studies of the properties of permafrost and the principles of construction on perennially frozen ground. It is an impressive work.

Frozen ground, he makes clear, is a unique foundation material with properties different from those of all unfrozen materials. It is a heterogeneous mixture—mineral particles of all sizes, ice, films of unfrozen water even at very low temperatures, and air bubbles—that is very sensitive to external influences. Its mechanical properties are strongly affected by temperature variations even in the subfreezing range, for example, and the frozen soil is subject to slow deformation under variable or constant loads. The design of stable structures on these soils requires not only a good deal of information about their properties at the time of construction, but valid predictions of mechanical changes in the permafrost that are likely to occur during the useful life of the structure.

The book, following a brief introductory section, is divided into two main parts. Part 1 consists of a comprehensive theoretical treatment of the nature of frozen soil, moisture migrations within it during and after freezing, elastic deformations and strength properties of the soil, and changes in its mechanical properties that take place under load or after thawing. The various preconstruction measurements that must be made and methods for calculating the behavior of permafrost under the anticipated load are discussed in detail. Experimental and testing methods are described, and examples of calculations are given.

The second part of the book is devoted to the practical applications of frozen-ground mechanics. Engineering surveys of construction areas, field and laboratory procedures for evaluation of the stability of the site, measures required to preserve the permafrost and to increase its strength, and construction procedures where it is feasible to thaw the permafrost are discussed. Again, examples of practical solutions to common problems are provided. The construction of buildings is emphasized, but short sections are devoted to frozen-core earth dams and to trenching and tunneling in frozen ground. Unfortunately, there is no discussion of highway construction in permafrost areas.

The Mechanics of Frozen Ground will undoubtedly become a standard reference work on the physico-mechanical properties of frozen soils. It is an exceptionally well-organized and well-written book, but it is not for the layman. Engineers concerned with the rapidly expanding construction activity in northern areas, however, will find it extremely useful.—**Samuel Rieger**, *state soil scientist, SCS, Palmer, Alaska.*

Highlights—1975

Summary of activities of the Soil Conservation Service for fiscal year 1975

As farmers and ranchers stepped up production, the Soil Conservation Service, during fiscal year 1975, provided technical assistance in soil and water management to more than 1 million land users through 3,000 local conservation districts.

Nearly 55 percent of the nation's land is now termed by SCS as "adequately treated" against soil erosion from wind and water.

In the 40th year of the Service, SCS technicians helped prepare 61,500 conservation plans covering nearly 22 million acres and helped revise 27,000 plans covering 18.4 million acres. More than 614 million acres of land in the United States are now covered by conservation plans. These plans establish conservation management systems suited to the needs of the land and the land user for adequate resource protection and more rational land use.

Conservation districts as of June 30, 1975, had 2.3 million voluntary cooperators — more than half of the nation's farmers —who were applying and maintaining soil and water conservation practices on nearly 793 million acres.

SCS technicians also provided onsite assistance to farmers, ranchers, and others to make sure that conservation measures were properly planned, installed, and maintained. In fiscal year 1975, SCS provided 2.7 million technical services to land owners and users. The agency also helped more than 14,000 groups of land users, such as neighboring landowners or community organizations, with conservation plans and related services.

During the year, SCS helped individuals and groups to install 2.4 million acres of contour farming; 366,200 acres of stripcropping; 170,700 acres of vegetative cover on critical areas; and 19,700 miles of terraces. These practices usually were part of an integrated management system.

Minimum tillage, including no-till farming, continued to be one of the fastest-growing conservation practices. It was tried on an additional 2.6 million acres. Total cropland under minimum tillage, which conserves fuel as well as soil, amounted to 36 million acres on the land June 30, 1975.

In cooperation with other interested agencies at the na-

tional, state, and local government levels, SCS began initial inventories in 100 counties to help local decisionmakers to identify prime and unique farmland. The inventory is expected to be an ongoing activity, and in the future will exclude monitoring land use.

Conservation help for units of government

SCS employees furnished nearly 130,000 services to nearly 31,000 local and state governments and their agencies during the year. Nearly 650 local ordinances concerned with land use and erosion and sediment control were passed by local governments, and SCS provided basic soil and water data for drafting these rules. SCS also assisted in preparing 17,500 natural resource inventories and evaluations. With these, local governments, with SCS help, can develop quality standards for conservation land use and treatment.

Woodlands and windbreaks

Landowners, with SCS technical assistance, planted 346,000 acres of trees, nearly 67,000 acres of farmstead and feedlot windbreaks, and more than 2,000 miles of field windbreaks. They prepared 216,000 acres for planting or seeding of forest crops, and improved another 313,000 acres of woodland. Improved harvesting was practiced on 960,000 more acres, to total 35 million acres nationwide.

Pasture and range conservation

SCS people helped farmers and ranchers with pasture and hayland plantings on more than 2.3 million acres during the year, bringing the on-the-land total of improved pasture to more than 77 million acres. SCS assisted in bringing pasture and hayland management to more than 8 million acres during the year for an on-the-land total of nearly 76 million acres. In the West, SCS technicians helped ranchers reseed nearly 381,000 acres, for an on-the-land total of more than 17 million acres.

Plant materials

During fiscal year 1975, seven new conservation plants were released by SCS with cooperating agencies. More than 120 kinds of improved plants selected or developed by SCS now are in commercial production or widespread use in conservation and environmental improvement programs. During the year, several agencies developed cooperative agreements with the Service for accelerating plant materials work for various conservation needs, such as the reclamation of surface-mined lands.

Wildlife

SCS specialists helped landowners improve 11.1 million acres of land and water for the specific benefit of wildlife during the year. They helped farmers install other measures which benefit wildlife, including more than 51,000 ponds.

Great Plains conservation program

During the year, more than 1,800 farmers and ranchers signed contracts under the Great Plains Conservation Program to apply permanent conservation measures on nearly 3.6 million acres. Nearly 50,000 farmers and ranchers have signed long-term contracts cov-

ering more than 90 million acres since the program began in 1956.

Resource conservation and development projects

Resource conservation and development projects are sponsored by conservation districts, local governments, and other public bodies to advance economic development and enhance the environment in multicounty areas. SCS has the program leadership in USDA for RC&D projects. During fiscal year 1975, 10 new RC&D areas in 10 states were authorized for assistance. This brought the total number of RC&D projects to 158, involving 1,057 counties and all states except Alaska.

Water bank program

The 1972 legislation that established the Water Bank Program (WBP) authorized the Secretary of Agriculture to enter into agreements and make payments to eligible persons in important migratory waterfowl nesting and breeding areas for the conservation of wetlands. During fiscal year 1975, SCS assisted land users in the preparation of 911 conservation plans that support water bank agreements. As of June 30, 1975, 2,368 plans had been developed or revised for the WBP agreements.

Long-term ACP assistance

SCS assisted farmers and ranchers in preparing 3,372 conservation plans that serve as a basis for long-term Agricultural Conservation Program (ACP) agreements. These agreements, which run as long as 10 years, provide cost sharing on selected conservation practices. These plans covered more than 1.6 million acres.

Water resources

Small watershed projects under Public Law 566 combine conservation measures on private and public land with dams and other structural measures to reduce floods and provide water supply, recreation, and wildlife habitat. During fiscal year 1975, 17 watershed projects were completed under P.L. 566, which was enacted in 1954. This brings the total completed since the program began to 396. Thirty-five projects were authorized for planning, bringing the total to 1,721 and 28 were approved for construction, bringing the cumulative total to 1,124. Construction starts were made during the year on 43 projects. About 9,000 man-years of construction work and related secondary jobs are now being generated, most of it in high unemployment rural communities.

Nine more river basin studies were completed during the year, bringing total completions to 76. Sixty-four additional studies were in progress. SCS also handled 16 flood hazard analyses and made 7 flood insurance studies.

Under the Emergency Assistance-Section 216 program of the Flood Control Act of 1950, more than $22 million was obligated in 1975 to install such emergency work as streambank stabilization, debris removal, and revegetation to protect life and property after storms and floods. Twenty-three states were involved.

Environmental services

SCS filed 64 draft and 31 final environmental impact statements with the Council on Environmental Quality during fis-

cal year 1975. During the same period, the agency commented on some 1,000 environmental impact statements from other agencies and cooperated in numerous environmental assessment efforts throughout the nation.

Soil surveys

The Service leads the National Cooperative Soil Survey, which has a goal of making and publishing soil surveys of all areas of the United States, Puerto Rico, and the Virgin Islands. During fiscal year 1975, nearly 50 million acres of the nation's land were mapped to show the location and kind of soil. This brings the area mapped under the cooperative federal program to 961 million acres as of June 30, 1975, plus an additional 354 million acres of exploratory soil surveys in Alaska. During the fiscal year, 118 new soil surveys were published covering 60.5 million acres. At the end of the fiscal year, SCS had 873 modern soil surveys covering 418.7 million acres.

Snow surveys

In the West, SCS snow surveyors measure the water content of the mountain snowpack in winter to estimate how much will be available in the spring and summer. In fiscal year 1975, snow surveyors took 6,278 separate snow course measurements and issued 3,793 water supply forecasts. Progress in automation of data sites continued, with remote sensing equipment purchased for 260 data sites and installed in 160. The data handling system, which includes computer terminals in each of the western states and a mini-computer in Portland, has been purchased and will be installed in fiscal 1976. Communication between the data sites and state office locations has been under study during fiscal 1975, with radio telemetry via either meteor burst or geostationary satellite being the prime candidate systems.

National water assessment

The Service is making major inputs to the 1975 national water assessment by the Water Resources Council. Special reports have been prepared for livestock water use, domestic water use from noncentral systems, upstream flood damages, and irrigation water use. Each displays a 1975 figure, plus projections for 1985 and 2000, by the 21 water resource regions and 106 aggregated subareas. The irrigation water use study was integrated into a more comprehensive model study involving quantity and value of agricultural production, income, employment, and land use changes and area shifts which might occur in 1985 and 2000.

Colorado River Basin salinity control program

Under authorities of P.L. 93-320, the Service is cooperating with the Bureau of Reclamation to implement programs which will reduce salt concentrations in the Colorado River. The Service is primarily concerned with activities which will improve on-farm irrigation efficiencies, thereby reducing water use, return flows, and salt loadings of the Colorado River due to agriculture. The first contract for cost sharing of irrigation improvements on an individual farm was signed June 26, 1975, for $16,000. There are 17 areas in the Colorado River Basin involving more than 1 million acres of irrigated agriculture that the Service will be studying. ♦

Summary of Progress, Fiscal Year 1975

Reportable progress in soil and water conservation programs assisted by the Soil Conservation Service

Progress item		Fiscal year 1975	Cumulative to June 30, 1975
Conservation plans and related services			
District cooperators	No.	78,176	2,311,133
District cooperators	acres	27,048,618	792,725,484
Land users assisted	No.	1,021,454	—
Services to land users	No.	2,677,544	—
Land users applying practices	No.	552,728	—
Conservation plans prepared	No.	61,454	1,824,108
Conservation plans prepared	acres	21,926,285	614,492,165
Conservation plans revised	No.	27,029	—
Conservation plans revised	acres	18,416,556	—
Inventories and evaluation prepared	No.	84,358	—
Federal lands under coordinated conservation plans	No.	80	1,447
Federal lands under coordinated conservation plan	acres	1,186,829	16,476,679
Resource planning and implementation for units of government and their agencies			
Units assisted	No.	30,841	—
Technical services	No.	129,514	—
Land use and treatment data provided	No.	14,668	—
Resource plan	No.	916	—
Inventories and evaluations	No.	17,512	—
Land use regulations using soil and water data	No.	648	—
Sites for public facility, selected	No.	1,680	—
Sites for public facility, investigated	No.	13,986	—
Long-term Agricultural Conservation Program			
Long-term agreements serviced	No.	4,159	—
Conservation plans for long-term ACP agreement	No.	3,372	3,811
Conservation plans for long-term ACP agreement	acres	1,615,398	1,737,531
Long-term ACP agreements expired or terminated	No.	135	138
Long-term ACP agreements expired or terminated	acres	41,446	42,681
Group conservation plans and related services			
Groups assisted	No.	14,387	—
Conservation plans prepared	No.	3,008	26,843
Inventories and evaluations	No.	4,835	—
Technical services	No.	71,058	—
Groups applying practices	No.	4,249	—
Great Plains contracts			
Applications received	No.	2,583	54,858
Applications received	acres	4,217,652	103,515,844
Contracts signed	No.	1,832	49,626
Contracts signed	acres	3,565,814	90,211,457
Contracts terminated	No.	2,664	34,307
Contracts terminated	acres	4,664,363	56,019,963
Cropland before GP contract	acres	468,880	13,696,256
Planned cropland conversions	acres	84,982	2,884,370
Water Bank Program			
Referrals serviced	No.	1,557	—
Plans developed	No.	911	2,368
Plans developed	acres	481,727	1,280,325
Wetland treatment completed	acres	65,906	—

Progress item		Fiscal year 1975	Cumulative to June 30, 1975
Soil surveys			
Detailed soil surveys	acres	40,772,561	879,039,534
Reconnaissance soil surveys	acres	9,144,289	81,887,029
Total surveys	acres	49,916,850	960,926,563
Exploratory soil surveys in Alaska	acres	—	354,062,240
Snow surveys			
Snow course measurements	No.	6,278	—
Aerial snow marker course readings	No.	762	—
Mountain precipitation gauge readings	No.	1,882	—
Sites with remote sensing	No.	160	—
River stations for which numerical forecasts issued	No.	465	—
Interpretive water supply forecasts issued	No.	987	—
Statistical forecasts issued	No.	2,806	—
Servicing other USDA programs			
Referrals serviced:			
ACP	No.	302,236	—
ACP-18-month program year	No.	—	140,243
Cropland Adjustment Program	No.	16	—
Appalachian Program	No.	189	—
Conservation plans approved	No.	41	—
Recreation development			
Land owners and operators:			
Establishing first commercial enterprise	No.	819	75,213
Establishing, expanding, or adding to public recreation developments	No.	398	55,072
River basin studies			
Flood hazard analyses	No.	16	—
Flood insurance studies	No.	7	—
River basin studies in progress	No.	64	—
River basin studies completed	No.	9	76
Watershed projects			
Applications	No.	23	2,910
Authorized for planning	No.	35	1,721
Approved for construction	No.	28	1,124
Construction starts	No.	43	919
Projects completed	No.	17	396
RC&D projects			
Applications on hand	No.	—	64
	acres	—	265,515,000
Project areas authorized for assistance	No.	—	158
	acres	—	666,157,000
Project areas in planning	No.	—	26
	acres	—	86,611,000
Project authorized for operation	No.	—	132
	acres	—	579,546,000
RC&D measures completed	No.	1,530	8,764

Summary of Progress, Fiscal Year 1975—Continued

Reportable progress in soil and water conservation programs assisted by the Soil Conservation Service

Progress item		Fiscal Year 1975	
Watershed and RC&D project measures			
		Watersheds	RC&D
Reservoir-type structure sites:			
Investigated	No.	266	117
Surveyed	No.	385	208
Reservoir-type structures:			
Designed	No.	575	193
Under construction	No.	1,022	292
Flow control structure sites:			
Investigated	miles	175	54
Surveyed	miles	267	87
Flow control structures:			
Designed	miles	545	54
Under construction	miles	906	149
Fish, wildlife, and recreation developments (public):			
Surveyed	No.	4	15
Designed	No.	4	9
Under construction	No.	21	21
Services provided on land rights, agreements, and contract awards	No.	14,949	2,415

Practice		Fiscal year 1975	On the land—June 30, 1975
Agricultural waste management systems	No.	1,258	5,235
Agricultural waste storage facility	No.	1,054	2,944
Bedding	acres	11,068	877,402
Brush management	acres	2,783,310	58,520,495
Burning, prescribed	acres	410,374	6,052,514
Chiseling and subsoiling	acres	784,053	11,435,498
Clearing and snagging	miles	367	8,647
Conservation cropping system	acres	15,604,805	221,581,436
Contour farming	acres	2,403,083	49,246,947
Critical area planting	acres	170,654	5,476,855
Crop residue management	acres	14,482,846	184,922,634
Dams, diversion	No.	246	25,113
Dams, multiple-purpose	No.	244	8,686
Dams, multiple-purpose	acre-feet	74,553	24,185,638
Debris basin	No.	2,403	77,851
Deferred grazing	acres	10,037,892	94,160,470
Dike	miles	237	13,556
Disposal lagoon	No.	978	8,219
Diversion	miles	2,444	106,314
Drainage field ditch	miles	3,673	190,632
Drainage land grading	acres	22,260	561,030
Drainage main or lateral	miles	4,263	391,733
Drain, subsurface	miles	28,606	938,261
Farmstead and feedlot windbreak	acres	66,698	904,464
Fencing	miles	4,069	616,234
Field border	miles	1,159	49,213
Field windbreak	miles	2,256	104,107
Firebreak	miles	2,523	47,119
Fishpond management	No.	45,523	777,102
Fish ponds, commercial	acres	5,020	65,471
Fish raceways	feet	9,053	458,347
Fish stream improvements	feet	163,587	3,361,036
Floodwater diversions	feet	74,159	1,895,734
Floodwater retarding structures	No.	285	12,462
Floodwater retarding structures	acre-feet	160,641	6,727,714
Floodways	feet	124,037	5,243,937
Grade stabilization structures	No.	13,881	263,277
Grassed waterways or outlets	acres	88,800	2,256,586
Grazing land, mechanical treatment	acres	8,197	1,402,796
Heavy use area protection	acres	1,982	197,928
Hedgerow planting	miles	351	25,079
Hillside ditch	miles	36	1,758
Holding ponds and tanks	No.	1,469	8,965
Irrigation canal or lateral	miles	182	56,856
Irrigation ditch and canal lining	miles	1,073	37,123
Irrigation field ditch	miles	1,179	131,206
Irrigation land leveling	acres	243,667	12,498,645
Irrigation pipeline	miles	4,675	110,947
Irrigation pit or regulating reservoir	No.	1,392	48,652
Irrigation storage reservoir	No.	164	41,695
Irrigation storage reservoir	acre-feet	14,397	8,830,119
Irrigation system, drip	No.	287	1,109
Irrigation system, drip	acres	9,122	53,202
Irrigation system, sprinkler	No.	5,441	149,911
Irrigation system, sprinkler	acres	525,898	10,662,212
Irrigation system, surface & subsurface	No.	4,819	183,035
Irrigation system, surface & subsurface	acres	542,584	18,953,563
Irrigation system, tailwater recovery	No.	1,663	20,284
Irrigation water management	acres	2,566,817	23,936,819
Land smoothing	acres	166,449	8,248,683
Lined waterway or outlet	feet	24,595	334,610
Livestock exclusion	acres	381,872	17,581,166
Minimum tillage	acres	2,603,095	35,829,153
Mulching	acres	47,132	1,722,286
Open channels	miles	412	17,069
Pasture and hayland management	acres	8,297,895	75,945,977
Pasture and hayland planting	acres	2,316,308	77,441,400
Pipeline for recreation or livestock	miles	2,873	42,220
Planned grazing systems	acres	4,757,037	55,645,443
Ponds	No.	51,167	2,116,786
Proper grazing use	acres	43,151,435	288,842,905
Pumping plant for water control	No.	2,905	145,687
Range seeding	acres	380,725	17,158,045
Recreation area improvement	acres	34,522	1,607,672
Recreation land grading and shaping	acres	14,532	429,566
Recreation trail and walkway	miles	548	16,555
Road, access	miles	2,228	36,862
Spring development	No.	3,742	146,551
Stock trails and walkways	feet	114,073	21,698,883
Stream channel stabilization	miles	46	1,270
Streambank protection	miles	607	11,250
Stripcropping	acres	366,229	22,524,440
Structure for water control	No.	62,730	2,204,846
Terrace, basin	miles	241	3,178
Terrace, gradient	miles	9,307	715,719
Terrace, level	miles	5,216	420,952
Terrace, parallel	miles	4,955	93,252
Total terraces	miles	19,719	1,233,101
Toxic salt reduction	acres	49,510	1,731,955
Tree planting	acres	345,788	22,692,157
Troughs or tanks for livestock	No.	10,926	615,254
Waterspreading	acres	30,444	1,275,444
Wells	No.	8,380	645,629
Wildlife wetland habitat management	acres	503,345	7,070,970
Wildlife upland habitat management	acres	10,628,330	76,685,436
Wildlife watering facility	No.	953	41,210
Woodland, direct seeding	acres	8,201	882,472
Woodland, improved harvesting	acres	960,307	35,250,357
Woodland improvement	acres	313,379	17,929,188
Woodland pruning	acres	15,184	376,763
Woodland site preparation	acres	216,386	6,162,879
Land treated			
Land protected during development	No.	1,751	14,737
Land protected during development	acres	38,903	386,597
Land adequately treated	acres	24,566,958	—
Land adequately protected	acres		— 1,235,014,088

Soil surveys

Arkansas

Howard County. By James E. Hoelscher, Charlie N. McCollum, and Glen D. Laurent. 1975. Soil Conservation Service and Forest Service in cooperation with Arkansas Agricultural Experiment Station. 75 pp., illus.; maps.

Colorado

Chaffee-Lake Area (Parts of Chaffee and Lake Counties). By Louis A. Fletcher. 1975. Soil Conservation Service in cooperation with Colorado Agricultural Experiment Station. 78 pp., illus.; maps.

New Jersey

Passaic County. By Lester L. Seglin. 1975. Soil Conservation Service in cooperation with New Jersey Agricultural Experiment Station and Cook College, Rutgers University. 69 pp., illus.; maps.

South Carolina

Greenville County. By Wallace J. Camp. 1975. Soil Conservation Service in cooperation with South Carolina Agricultural Experiment Station and South Carolina Land Resources Conservation Commission. 71 pp., illus.; maps.

Meetings

February

1–5 *National Association of Conservation Districts, Honolulu, Hawaii*
4–6 *Commercial Fish Farmer Showcase (Catfish Farmers of America Official Convention), Biloxi, Miss.*
16–20 *Society for Range Management, Omaha, Nebr.*
18–24 *American Association for the Advancement of Science, Boston, Mass.*
20–23 *American Association of School Administrators, Atlantic City, N.J.*
22–25 *Sprinkler Irrigation Association Technical Conference, Kansas City, Mo.*
25–27 *Land Improvement Contractors of America, San Diego, Calif.*

March

2–6 *American Camping Association National Convention, Philadelphia, Pa.*
13–17 *Association for Supervision and Curriculum Development, Miami Beach, Fla.*
15–18 *Land Application of Waste Materials Conference, Des Moines, Iowa*
19–21 *National Wildlife Federation, Louisville, Ky.*
19–23 *National Science Teachers Association National Convention, Philadelphia, Pa.*
22–25 *Third Federal Inter-Agency Sedimentation Conference, Denver, Colo.*
28–Apr. 2 *American Concrete Pipe Association, Coronado, Calif.*

April

5–6 *American Pulpwood Association, Atlanta, Ga.*
5–7 *Cordilleran Section Annual Meeting of the Geological Society of America, Pullman, Wash.*
7–9 *Fourteenth Annual Symposium on Engineering Geology and Soils Engineering, Boise, Idaho*
12–16 *American Geophysical Union, Washington, D.C.*
25–27 *Chamber of Commerce of the United States, Washington, D.C.*
26–29 *International Hydrology Symposium, Bowling Green, Ky.*

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